

much in general I shall hint, that I suppose the *medium* MMM to have less of the transparent undulating subtile matter, and that matter to be less implicated by it, whereas LLL I suppose to contain a greater quantity of the fluid undulating substance, and this to be more implicated with the particles of that *medium*.

But to proceed, the same kind of *obliquity* of the Pulses and Rays will happen also when the refraction is made out of a more easie into a more difficult *mediū*; as by the calculations of G Q & C S R which are refracted from the perpendicular. In both which calculations 'tis *obvious* to observe, that always that part of the Ray towards which the refraction is made has the end of the *orbicular pulse* precedent to that of the other side. And always, the oftner the refraction is made the same way, Or the greater the single refraction is, the more is this unequal progress. So that having found this odd propriety to be an inseparable concomitant of a refracted Ray, not streightned by a contrary refraction, we will next examine the refractions of the Sun-beams, as they are suffer'd onely to pass through a small passage, *obliquely* out of a more difficult, into a more easie *medium*.

Let us suppose therefore ABC in the second Figure to represent a large *Chimical Glass-body* about two foot long, filled with very fair Water as high as AB, and inclin'd in a convenient posture with B towards the Sun: Let us further suppose the top of it to be cover'd with an *opaque* body, all but the hole *a b*, through which the Sun-beams are suffer'd to pass into the Water, and are thereby refracted to *c d e f*, against which part, if a Paper be expanded on the outside, there will appear all the colours of the Rain-bow, that is, there will be generated the two principal colours, *Scarlet* and *Blue*, and all the *intermediate* ones which arise from the composition and dilutings of these two, that is, *c d* shall exhibit a *Scarlet*, which toward *d* is diluted into a *Yellow*; this is the refraction of the Ray, *i k*, which comes from the underside of the Sun; and the Ray *e f* shall appear of a deep *Blue*, which is gradually towards *e* diluted into a pale *Watchet-blue*. Between *d* and *e* the two *diluted* colours, *Blue* and *Yellow* are mixt and compounded into a *Green*; and this I imagine to be the reason why *Green* is so acceptable a colour to the eye, and that either of the two extremes are, if intense, rather a little offensive, namely, the being plac'd in the middle between the two extremes, and compounded out of both those, *diluted* also, or somewhat qualify'd, for the composition, arising from the mixture of the two extremes *undiluted*, makes a *Purple*, which though it be a lovely colour, and pretty acceptable to the eye, yet is it nothing comparable to the ravishing pleasure with which a curious and well tempered *Green* affects the eye. If removing the Paper, the eye be plac'd against *c d*, it will perceive the lower side of the Sun (or a Candle at night which is much better, because it offends not the eye, and is more easily manageable) to be of a deep *Red*, and if against *e f* it will perceive the upper part of the luminous body to be of a deep *Blue*; and these colours will appear deeper and deeper, according as the Rays from the luminous body fall more *obliquely* on the surface of the Water, and thereby suffer a greater refraction, and the more

more distinct, the further *c d e f* is removed from the luminous body. So that upon the whole, we shall find that the *radiation* seems to depend upon the *obliquity* of the *orbicular* Radiation, and in particular, that the Ray *c d* which is next to the luminous body, has its inner parts, namely those which are next to the luminous body, precedent to the outermost which is next to the dark and *unradiating* skie. And that the Ray *e f* which is next to its outward part, namely, that which is contiguous to the dark, is precedent to the pulse from the innermost, which bordereth on the luminous body.

We may observe further, that the cause of the *dilatation* of the Rays towards the middle, proceeds partly from the widening of the luminous body, which the Rays pass, whereby the Rays from several parts of the luminous body, fall upon many of the same parts between the Paper and the eye, manifest by the Figure: And partly also from the nature of the Rays themselves, for the vividness or strength of the two termini of the Rays, chiefly as we have seen, from the very great difference of the outsidings of those *oblique undulations* & the dark Rays, that disparity betwixt the *approximate* Rays, decaying as they move further inward toward the middle of the luminous body, so that the more must the colour approach to a white or an

Upon the calculation of the refraction and reflection of the Rays in Water or Glass, we have much the same *Phænomena*, as we have found in the undulation in the same manner as we have found in the Rain-bow, cause it is very much to our present purpose, and affords a new *crucis*, as no one that I know has hitherto taken notice of. For it does very plainly and positively confirm the truth of which of the two *Hypotheses*, either the *Cartesian* or the *Newtonian*, by affording a generation of all the colors in the Rain-bow, according to the *Cartesian Principles* there should be none at all. Secondly, by affording an instance that does more than confirm the cause of these *Phænomena* of colours to this present purpose.

And first, for the *Cartesian*, we have this to object against it, that he says (*Meteorum Cap. 8. Sect. 5.*) *Sed judicabam unicuique ad minimū requiri, & quidem talem ut ejus effectus a seipso non destrueretur: Nam experientia docet si superficies refringentes Parallele forent, radios tantundem per se ipsas quantum per unam frangerentur, nullos colores depicturos.* This holds true indeed in a prism where the refracting surfaces are parallel, but is contradicted by the Ball or Cylinder, whether the refracting surfaces are Orbicular or Cylindrical. To examine the passage of any Globule or Ray of the prism, it is to pass out of the Ball or Cylinder again, with the same refraction that it enter'd in withall, and that that last reflection of the *intermediate* reflection shall be the same as the first reflection at all the Ray had been twice refracted.